ILA LFVU Model Solutions
Fall 2017

1. **Learning Objectives:**
   3. The candidate will understand and apply emerging financial and valuation standards, principles and methodologies.

Learning Outcomes:
(3a) Describe, evaluate and calculate the impact on reserves, income, capital, and processes of emerging developments in Statutory and U.S. GAAP reporting, International Financial Reporting Standards, and Solvency Modernization.

Sources:
LFV-134-16: IFRS PWC Ready or Not, October 2014

LFV-132-14: Practical Guide to IFRS, PwC (July 2013)

IFRS 4 Phase II: Illustrative Example of Life Contract Without Participation Features, EY June 2015

Commentary on Question:
This question tested the candidates' understanding of emerging standards of practice under IFRS17 and how various balance sheet and income items are calculated.

Solution:
(a)
   (i) Calculate the Contractual Service Margin (CSM) at issue. Show all work.

   (ii) You are given the following at the end of policy year 1:

   - Best estimate liability: -7.92
   - Risk adjustment: 5.48

   Calculate the CSM at the end of policy year 1, assuming no changes in assumptions. Show all work.

1. Continued

Commentary on Question:
Candidates were generally able to earn partial credit for their responses. There were two common errors. First, the equation $0 = BEL + RA + CSM$ is not correct as it ignores the fact the CSM cannot be negative. Second, most candidates struggled on part (ii) attempting to calculate the CSM using the BEL and RA at time 1 instead of amortizing the time zero CSM using a metric they deemed appropriate.

(i) $BEL = (0.2\% * 25,000) + (0.3\% * 20,000) + (6.5\% * -20) +$
        $(53\% * -50) + (40\% * -243) = -15$

   $CSM = Max(0, -(BEL + RA)) = Max(0, -(-15+11) = Max(0, 4) = \textbf{4}$

(ii)   The CSM is amortized over the coverage period in a systemic way that best reflects the remaining service

   The CSM is adjusted for changes in cash flows related to future service, but not for current and past coverage

   As assumptions about the future have not changed:

   $CSM_1 = CSM_0 *$ Amortization Factor

   For short duration term, a straight-line method is reasonable for amortizing the CSM:

   $CSM_1 = CSM_0 * (1/2) = 4 * 0.5 = \textbf{2}$

   Note - Other Amortization patterns (claims, BEL, etc) were appropriate and able to earn full credit providing the candidate justified their approach

(b)   Determine the direction of each event's impact, if any, on the following policy year 1 financial results:

   (i)   the underwriting result on the income statement

   (ii)   the investment result on the income statement

   (iii)   other comprehensive income

   Justify your responses.

1. Continued

Commentary on Question:
*Candidates were generally able earn partial credit for their responses. A common error was that candidates assumed the impact of discount rate changes must flow through OCI. This is incorrect, since IFRS17 allows an entity the option of recognizing the impact of discount rate changes in **either** P&L or OCI. To receive full credit, the candidate needed to identify the earnings emergence under both options.*

A – The probability of converting is increased

(i)   Underwriting Result – Assumption changes unlock the CSM. Thus, there is no impact to the UW result unless the value of the assumption change exceeds the remaining CSM.

(ii)   Investment Results – No impact as changes in policyholder behavior are recognized in Underwriting Results

(iii)   OCI – No impact as changes in policyholder behavior are recognized in Underwriting Results

B – The discount rate is increased

(i)   Underwriting Result – No impact as changes in discount rate are recognized in either Investment Income or OCI

Under IFRS 17 and entity has the option of reflecting changes in discount rate in either Investment Income or OCI. If the entity has chosen to recognize discount rate changes in Investment Income:

(ii)   Investment Results – Positive Impact due to a lower liability

(iii)   OCI – No impact

If the entity has chosen to recognize discount rate changes in OCI:

(ii)   Investment Results – No impact

(iii)   OCI - Positive Impact due to a lower liability

1.   Continued

C – The policyholder does not die

(i)   Underwriting Result – Positive impact as claims paid are less than expected

(ii)   Investment Results – No impact as demographic experience is recognized in Underwriting Results

(iii)   OCI – No impact as demographic experience is recognized in underwriting Results

D – The policyholder does not lapse

(i)   Underwriting Result – Positive impact as persistency improves and more premium is collected than expected

Note - Stating this had a negative impact to underwriting results was also appropriate as the direction of the change was ambiguous

(ii)   Investment Results – No impact as demographic experience is recognized in Underwriting Results

(iii)   OCI – No impact as demographic experience is recognized in Underwriting Results

2. Learning Objectives:

5. The candidate will understand the nature and uses of basic reinsurance arrangements used by life insurance companies.

Learning Outcomes:

(5a) The candidate will understand the various forms of reinsurance, and be able to, with respect to both the ceding and assuming parties, analyze and evaluate:
  (i) Risk transfer considerations
  (ii) Cash flow mechanics
  (iii) Accounting and financial statement impacts
  (iv) Reserve credit considerations

Sources:

Life, Health & Annuity Reinsurance, Tiller, 4th Edition

Commentary on Question:

This question tested the candidates' knowledge of quota share reinsurance.

Solution:

(a) Explain the advantages and disadvantages of coinsurance to reinsure an inforce block of business.

Commentary on Question:

Candidates generally did well on this part of the question.

Advantages:
- Coinsurance is relatively simple to administer
- Fewer questions regarding the transfer of risk from the regulator point of view.

Disadvantages:
- Need to transfer assets equal to the initial reserves less allowance
- For interest sensitive or par products the reinsurer may want effective control or veto power over the dividend or interest rate determination
- Coinsurance requires the reinsurer to manage the assets and subjects the reinsurer to investment risk
- If reinsurance is terminated, assets equal to the reserves less any termination fee must be transferred to the ceding company
- If the reinsurer does not meet required standards the ceding company may be unable to take credit in its statutory statements for the reserves held by the reinsurer
- Coinsurance subjects the ceding company to additional credit risk

2. Continued

(b) Calculate the gain from operations for each company in year t. Show all work.

Commentary on Question:
This part of the question tested candidates' understanding of reinsurance on a quota share basis and excess loss basis. Most candidates did well at working out the financials for quota share reinsurance, but only a few got the excess loss basis right.

A common mistake was on the reserve calculation. Since death benefits are assumed to incur at the end of the year, the ending reserve should be calculated using number of lives after decrement. Most candidates did not consider decrements in the reserve calculation.

Another common mistake was that many candidates did not include the investment income on net premium.

GHI
Reinsurance Amount per life for GHI for each cohort $= (DB*Quota\ Share\%\_DEF) - 500$
Reinsurance % for GHI $= (Reins\ Amt)/(Total\ DB)$ *Since all lives are identical*
$GHIReins\%\_1 = Max(((1500*0.6)-500)/1500,0) = 26.7\%$
$GHIReins\%\_2 = Max(((800*0.6)-500)/800,0) = 0\%$
GHI Premium $= \sum Prem\_i * \#Lives\_i * Reins\%\_i$
$DEFReins\%\_i = 100\% - ABCIns\% - GHIReins\%\_i$
$DEFReins\%\_1 = 33.3\%$
$DEFReins\%\_2 = 60.0\%$
$Claims = Total\ Claims * Reins\%$
$ReserveIncrease\_i = (Reserve\_t * \#Lives\ EOY\_i - Reserve\_(t-1) * \#Lives\ BOY\_i) * Reins\%\_i$

2. Continued

Company	Invested assets	Operating expenses					
ABC	1750	100					
DEF	3000	50					
GHI	500	25					

Cohort	Face Amount per Policy	Reserve(t-1)	Reserve(t)	Annual Premium / Policy	Number of lives (BOY)	Total Claims
1	1,500	3.50	3.75	9.00	200	1500
2	800	4.30	4.45	5.40	400	2400

Quota Share %	0.6	Retained amount	500
Return on Inv	0.035		

GHIReins%1	26.7%
GHIReins%2	0.0%
ABCIns%	40%
DEFReins%1	33.3%
DEFReins%2	60.0%

Reserve increase1	50	46.25	less expected deaths
Reserve increase2	60	46.65	less expected deaths

	ABC	DEF	GHI
Revenue			
Premiums			
Gross	3,960	2,376	480
Ceded	2,376	480	
Net	1,584	1,896	480
Investment Income	117	171	34
Total Revenue	**1,701**	**2,067**	**514**
Benefits			
Claims			
Gross	3,900	2,340	400
Ceded	2,340	400	
Net	1,560	1,940	400
Reserve Increase			
Gross	93	56	12
Ceded	56	12	
Net	37	43	12
Total Benefits	**1,597**	**1,983**	**412**
Expenses			
Operating	100	50	25
Total Expenses	**100**	**50**	**25**
Gain from Operations	**4**	**34**	**77**

2. Continued

(c)   Recommend whether company ABC Life should recapture the business. Justify your answer.

Commentary on Question:
Most candidates did poorly on this part of the question. Candidates should analyze the Net and Gross profit to support the correct recommendation. Many candidates made the recommendation solely based on net profits calculated in part (b), which could lead to the incorrect recommendation.

Consider the profit from operations with and without reinsurance:
*   Net of reinsurance result =4,000
*   Gross of reinsurance result = 3960 + 200 (inv inc) - 3900 - 93 - 100 = 67,000
*   Since gross profit is higher than net profit, ABC operating result will improve if recapture the business

Other considerations for recapture:
*   recapture fee: financial analysis on whether or not to recapture should also take into consideration of recapture fee, if any.   This is the compensation the insurer has to pay the reinsurer in order to recapture the business
*   should consider the net of reinsurance vs gross of reinsurance results for all projection years rather than just based on year t result.

3. **Learning Objectives:**
4. The candidate will understand basic financial management, capital management and value creation principles and methods in a life insurance company context.

Learning Outcomes:

(4a) Assess financial performance, including analyzing and interpreting the financial performance of a product line or company.

(4c) Explain and apply methods in determining risk based capital and economic capital.

Sources:
"Strategic Management of Life Insurance Company Surplus," TSA XXXVIII (pages 105-116)

LFV-137-16: Kraus 2011 – EVARAROC vs. MCEV Earnings – A Unification Approach

Commentary on Question:
This question tested candidates' understanding of basic capital management and value creation principles. Candidates were required to perform the calculation of various return measures and then make an assessment or recommendation using those returns. In general, candidates did a good job on the calculations of the return measures but struggled with their assessments and recommendations.

Solution:

(a) Assess the equity allocation in the five-year financial plan based on cost of capital. Show all work.

Commentary on Question:
Candidates generally did well in calculating the cost of capital and equity growth rates for each individual profit center. Most candidates were able to draw the correct conclusions regarding the impact of each profit center on economic value and free cash flow. However, only few candidates were able to correctly draw these conclusions for the overall plan at an aggregate level.

Cost of Capital
- Cost of equity: 7%+6% = 13%
- After tax cost of debt: 14%*(1-35%) = 9.1%
- Cost of capital = 50%*(13%+9.1%) = 11.05%

3. **Continued**

Equity Growth Rates
- Traditional: (70/50)^1/5-1 = 6.96%
- Non-traditional: (450/230)^(1/5)-1 = 14.37%

- Non-insurance: (340/120)^(1/5)-1 = 23.16%
- Total company: [(70+450+340)/(50+230+120)]^(1/5)-1 = 16.54%

- Total company ROE =
  (17%*70+8%*450+12%*340)/(70+450+340) = 10.31%

Observations and Assessment
- Traditional
  - creating economic value (trad ROE > cost of capital)
  - generating free cash flow (trad equity growth rate < total company ROE)
- Nontraditional
  - destroying economic value (non-trad ROE < cost of capital)
  - consuming free cash flow (non-trad equity growth rate > total company ROE)
- Noninsurance
  - creating economic value (non-ins ROE > cost of capital)
  - consuming free cash flow (non-ins equity growth rate > total company ROE)
- Aggregate
  - destroying economic value (total company ROE < cost of capital)
  - consuming free cash flow (total company equity growth rate > total company ROE)
  - plan could be improved by allocating more capital to traditional and less to nontraditional

(b)

(i) Calculate the return on capital assuming the cost of capital is 10%. Show all work.

(ii) Recommend whether WXY should launch the term product given the economic capital requirement on a risk adjusted basis. Show all work.

3. Continued

Commentary on Question:
In part (i), most candidates were able to perform the calculation of ROC. However, many candidates failed to calculate the correct pre-tax income. Some candidates missed the interest on required capital piece in their formulas. In part (ii), most candidates did well in choosing the correct economic capital. However, few candidates calculated the correct RAROC and compared it to the hurdle rate to make the recommendation.

Part (i)
- Interest on required capital = 10%*250 = 25
- Pre-tax income: Premium & fees + inv income + interest on req required capital - expenses - benefits = 650+25+25-120-525 = 55
- After tax income = 55*(1-0.35) = 35.75
- ROC = after tax income/ required capital = 35.75/250 = 14.3%

Part (ii)
Calculations:
- Choose Economic Capital (EC) of 625K (99.5% percentile for the 1-in-200 loss)
- Interest on EC = 10%*625 = 62.50
- Pre-tax income = 650+25+62.50-120-525 = 92.50
- After tax income = 92.50*(1-0.35) = 60.13
- RAROC = after tax income/EC = 60.13/625 = 9.62%

Analysis and Recommendation:
Since the RAROC is less than the hurdle rate (cost of capital = 10%), this product does not add value to the company. The launching of this product is therefore not recommended.

4. **Learning Objectives:**
2. The candidate will understand valuation principles and methods of individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(2a) Compare and apply methods for life and annuity product reserves.

(2b) Evaluate, calculate, and interpret liabilities and DAC assets.

(2c) Recommend and justify appropriate valuation assumptions.

Sources:
LFV-822-16: Study Note on Actuarial Guidelines 38 and 48

Commentary on Question:
This question tested the candidates' knowledge of Actuarial Guidelines 38 and 48.

Solution:
(a) Calculate the final Actuarial Guideline 38 (AXXX) basic reserve and deficiency reserve at the end of policy year 3 assuming:

    (i)   the policy was issued in 2003.

    (ii)   the policy was issued in 2013.

Show all work.

Commentary on Question:
This part of the question tested candidates' understanding of the 9-step process to calculate AG38. Most candidates struggled with this part of the question. Candidates were given credit for correctly identifying which version of AG38 applied to the policy sold in 2003 versus 2013. The key difference between the 2003 and 2013 issues is that (1) a 7% load is applied to the 2013 guaranteed NSP and (2) the surrender charges are adjusted for the secondary guarantee period compared to a whole life guarantee.
Candidates were required to calculate all components of the AG38 reserves (base and deficiency) to receive full credit. If candidates missed the calculation in a particular step but carried the results of the step consistently throughout the rest of the AG38 calculations, no additional points were deducted.

4. **Continued**

a. (i)

A policy issued in 2003 will fall under Section 8A of the revised AG38.
- The XXX basic reserve = 150, and the XXX deficiency reserve = 100. So (b) = 250.
- Shadow account = 60, so (c) = 60.
- Single guarantee funding premium = 120, so (d) = 60 / 120 = 50%.
- Net Single Valuation Premium - 300, so (e) = 300.
- Net Amount of additional premiums is (d) x [(e) - (b)] = 50% x [(300) - (250)] = 25, so (f) = 25.
- **Reduced deficiency reserve** is the deficiency reserve from (b) x [1 -(d)] = 100 x (1 -50%) = 50, so (g) = **50**
- The minimum reserve is Min[(e), (f) + (b)] = Min(300, 25 +250) = 275
- This is then reduced by applicable surrender charges, so 275 - 20 = 255, so (h) = 255
- Then the **increased basic reserve** = (h) - (g) = 255 - 50 = **205**

a (ii)

A policy issued in 2013 will fall under Section 8E of the revised AG38.
- The XXX basic reserve = 150, and the XXX deficiency reserve = 100. So (b) = 250.
- Shadow account = 60, so (c) = 60.
- Single guarantee funding premium = 120, so take 120 / 0.93 = 129. Then get the ratio by dividing (c) by this amount. (d) = 60 / 129 = 46.5%
- Net Single Valuation Premium - 300, so (e) = 300.
- Net Amount of additional premiums is (d) x {(e) - (b)] = 46.5% x [(300) - (250)] = 23.25, so (f) = 23.25
- **Reduced deficiency reserve** is the deficiency reserve from (b) x [1 -(d)] = 100 x (1 -46.5%) = 53.5, so (g) = **53.5**
- The minimum reserve is Min[(e), (f) + (b)] = Min(300, 23.25 +250) = 273.25
- This is then reduced by applicable surrender charges times the ratio of the NLP for the secondary guarantee period vs the NLP for the whole life, so 273.25 – [20 x (30 / 120)] = 273.25 - 5 = 268.25, so (h) = 268.25
- Then the **increased basic reserve** = (h) - (g) = 268.25 - 53.5 = **214.75**

(b) Justify an opinion on whether ORD Re satisfies the requirements of Actuarial Guideline 48 (AG 48), and suggest remedies if ORD Re does not.

Show all work.

Commentary on Question:
Candidates were generally able to identify and calculate the total STAT reserve and Actuarial Method reserve. Candidates generally identified that Primary Securities could be backed by the SVO listed bonds, but this meant ORD Re was short on primary securities. Most candidates did not address the Other Securities or the RBC cushion needed to back the total liabilities. Credit was given for plausible remedies, such as investing in more SVO listed bonds via the sale of commercial loans.

4. Continued

- The total AXXX reserve that must be funded is the AXXX basic reserve + AXXX deficiency reserve = 400 + 50 = 450
- The Actuarial Method reserve is the greatest of the AG48 stochastic, deterministic, or net premium reserve = Max (250, 300, 100) = 300
- This means that at least 300 of the reserves must be funded with Primary Securities including cash, SVO listed securities, and, for funds withheld and ModCo treaties, commercial loans, policy loans, and derivatives used in hedging
- The investment strategy given shows $250 of SVO listed bonds and $150 of commercial loans and derivatives. Since the structure is coinsurance and no funds are held at the cedent, the $150 of commercial loans and derivatives are not considered primary securities. Therefore, we are short on primary securities.
- Provide discussion of possible remedies to meet primary security requirement. Examples would include restructure of reinsurance agreement to funds withheld or modco agreement and shifting of assets into SVO listed bonds.
- In addition, we also need 200 of Other Securities to fund the remaining layer of reserves, which we have available when we include the letter of credit. Other Securities = 100 + 50 + 100 = 250
- One of the parties to the transaction also needs to hold an RBC cushion, and it is currently not clear what that is in this transaction given that it is listed as NA. It is also not yet defined yet by the NAIC what the cushion needs to be.

(c) The appointed actuary of RHM has made the following comments regarding AG 48 compliance:

A. *VM 20 and AG 48 allow for exclusions from calculating the stochastic reserve for universal life policies if certain conditions are met.*

B. *Analysis for AG 48 compliance must be conducted for each reinsurance treaty and not just in aggregate for the entire operating company.*

C. *We are allowed to apply a reduction percentage to reduce the net premium reserve calculated under prescribed mortality rates.*

D. *Unless we comply with the AG 48 framework by December 31 of the year the actuarial opinion is filed, we will lose some reserve credit.*

Critique each statement.

Commentary on Question:
Candidates struggled to receive full credit on this part of the. Many candidates failed to address whether the statement was true or false. Many candidates did not demonstrate an understanding of AG48 and its compliance requirements.

4.   Continued

- A. False. No exclusions exist for calculating the stochastic reserve under AG 48, although they do exist under VM 20.
- B. True. This analysis must be done on a treaty by treaty basis, and not in aggregate.
- C. True. A reduction percentage is allowed to the net premium reserve that varies by issue age, gender, and smoking status.
- D. False. iv. The appointed actuary can take action until March 31 of the year in which the opinion is filed, not Dec 31. In addition, the consequences are that an opinion must be filed, and full reserve credit may be removed, not just some.

5. **Learning Objectives:**
1. The candidate will understand U.S. life insurance company financial statements and reports.

2. The candidate will understand valuation principles and methods of individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(1c) Describe, apply and evaluate regulatory documentation and disclosure requirements.

(2a) Compare and apply methods for life and annuity product reserves.

(2b) Evaluate, calculate, and interpret liabilities and DAC assets.

(2c) Recommend and justify appropriate valuation assumptions.

Sources:
US GAAP for Life Insurers, Herget, Chapters 8

ASOP 10

Commentary on Question:
This question tested candidates' knowledge of GAAP balances and the assumptions used in their calculation.

Solution:
(a) Calculate JKL's DAC balance for this product at the end of policy year 2. Show all work.

Commentary on Question:
This part of the question tested candidates' knowledge of DAC assets and the interaction that a SOP03-1 liability has on the DAC EGPs. Candidates who recognized the need for a SOP 03-1 liability generally performed well. Some candidates failed to recognize excess benefits in the unadjusted EGP. There are alternate formulations for DAC and SOP calculations (i.e., prospective formulas) that are equally valid and were given full credit.

5. **Continued**

1. Calculating SOP liability: SOP 03-1 Liability(t) = SOP 03-1 Liability(t-1)*(1+ i) + K*Gross Assessments(t) – Benefit(t)
   SOP(1) = 0*1.05 + .09*1550 – 0 = 139.5
   SOP(2) = 139.5*1.05 + .09*1420 – 120= 154.275

   SOP(3) = 154.275*1.05 + .09*1180 – 268= ~0

2. Calculating change in SOP liability = Liability(t) - Liability(t-1)
   Liability Increase(1) = 139.5 –0 = 139.5
   Liability Increase(2) = 154.275-139.5 = 14.775

   Liability Increase(3) = 0-154.275 = -154.275

3. Calculating unadjusted EGP = Gross Assessments – Maintenance Expenses – Benefits
   Unadj EGP(1) = 1550 - 30 -0= 1520
   Unadj EGP(2) = 1420 – 25 – 120 = 1260.225

   Unadj EGP(3) = 1180 – 22 – 268 = 890

4. Derive EGP = Unadjusted EGP – SOP 03-1 Liability Increase
   EGP(1) = 1520 – 139.5 = 1380.5
   EGP(2) = 1275 – 14.775 = 1260.225
   EGP(3) = 890 – (-154.275) = 1044.275

5. Calculate PV(EGP) using the discount rate provided
   PV(EGP) = $1380.5/1.05 + 1260.225/1.05^2 + 1044.25/1.05^3 = 3359.89$

6. Calculate DAC Amortization Ratio K = PV(Capitalized Expenses)/PV(EGP)
   DAC K = 1600/3359.89 = 47.621%

7. Finally calculate DAC(t) = (DAC(t-1) + Capitalized Expenses)*(1+i) – K*EGP(t),
   DAC(0) = Capitalized Expenses = 1600
   DAC(1) = (0+1600)*(1.05)- 47.621%*1380.5 = 1022.6
   DAC(2) = (1022.6 + 0) * (1.05) - 47.621%*1260.225 = **473.60**

(b) JKL's documentation for the product's best estimate mortality assumption states the following:

"As the company currently has no experience with variable annuity death benefits, the best estimate mortality assumption is set to be equal to the standard non-smoking mortality class used for the company's variable universal life product."

Critique the mortality assumption with respect to ASOP 10.

5. Continued

Commentary on Question:
This part of the question required candidates to analyze the appropriateness of setting liability assumptions in accordance with GAAP and within the context of the relevant ASOP. There were multiple variations to the solution that were given full credit. Necessary elements to include were statements describing the inappropriateness of specific items from the assumption, combined with a well-reasoned critique based on material from ASOP 10. Most candidates described the aspects of the assumption that were inappropriate, but many candidates did not reference ASOP 10 correctly.

ASOP 10: The assumptions in total reflect all pertinent areas of expected future experience and are specific to the product or line of business being valued.

This statement on mortality would not be appropriate given that it is stated that the assumption is coming from a completely different product line. There could be differences driven by underwriting or the type of buyer.

ASOP 10: Data should be company specific, if available. If not available, consider industry data or data from similar companies and adjust as appropriate.

Given that the company has no experience with this assumption, should have started with industry data or some other external source.

6. **Learning Objectives:**
1. The candidate will understand U.S. life insurance company financial statements and reports.

2. The candidate will understand valuation principles and methods of individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:
(2a) Compare and apply methods for life and annuity product reserves.

(2b) Evaluate, calculate, and interpret liabilities and DAC assets.

(2c) Recommend and justify appropriate valuation assumptions.

Sources:
Study Note LFV-802-07, Chapter 7 section 807(f) and Changes in the Computation of Reserves

Commentary on Question:
This question tested candidates' knowledge of tax reserves and taxable income. For each of the five events, candidates were required to identify the type of change (classification) as recognized by the IRS and provide the evidence, as described in the event, to support the type of change. In addition, candidates must determine the resulting tax reserve deduction and the impact on future taxable income, if any, that is required by the IRS due to the type of change in the current calendar year and beyond.

The most common omission by candidates was not providing a reason to support their selection. Some candidates had difficulty identifying the difference between a tax reserve deduction in the current calendar year and the impact to taxable income in future years.

Solution:
Calculate the impact on 2016 taxable income for each of the above events. Show all work.

Event A: De-strengthening reserves in 2016 by changing the statutory interest rate from 3.5% to 4% is a "Change in Basis" under Section 807(f).

The resulting tax reserve deduction to taxable income in 2016 = "Before Change" December 31, 2016 Tax Reserves – "Before Change" December 31, 2015 Tax Reserves = 6.5 million – 5.0 million = 1.5 million.

The difference between "After Change" December 31, 2016 Tax Reserves and "Before Change" December 31, 2016 = 5.5 million – 6.5 million = -1.0 million is deducted ratably over the next 10 years beginning in 2017.

---

6. **Continued**

Event B: Omission of a block of universal life policies issued in 2015 due to a computer programming error had resulted in tax reserves for this block of business not being reported at December 31, 2015, but was reported at December 31, 2016 is a "Correction of an Error", as noted in Revenue Ruling 94-74.

The resulting tax reserve deduction to taxable income in 2016 = "Corrected" December 31, 2016 Tax Reserves less "Corrected" December 31 Tax Reserves = 5 million – 4 million = 1 million.

The "corrected" 4 million tax reserve deduction in 2015 is permanently excluded from taxable income.

Event C: Revising tax reserve factors to update the assumption of the timing of death benefits to occur continuously rather than at the end of the policy year is a "Change in Basis" under Section 807(f) as ruled by the IRS in Revenue Ruling 94-74.

The resulting tax reserve deduction in 2016 = "Before Change" December 31, 2016 Tax Reserves – "Before Change" December 31, 2015 Tax Reserves = 27 million – 25 million = 2 million.

The difference between "After Change" December 31, 2016 Tax Reserves and "Before Change" December 31, 2016 Tax Reserves = 28 million – 27 million = 1 million is deducted ratably over the next 10 years beginning in 2017.

Event D: The correction of interest rates in 2016 used in the calculation of tax reserves for a block of 2010-issued single premium whole life policies is a "Change in Basis" under Section 807(f), and is not a "Correction of an Error".

The resulting tax reserve deduction in 2016 = "Before Change" December 31, 2016 Tax Reserves – "Before Change" December 31, 2015 Tax Reserves = 12 million – 10 million = 2 million.

The difference between "After Change" December 31, 2016 Tax Reserves and "Before Change" December 31, 2016 Tax Reserves = 15 million – 12 million = 3 million is deducted ratably over the next 10 years beginning in 2017.

Event E: Changing valuation systems from a homegrown to a third-party system that are similar except for technical differences, like rounding, timing of deaths and lapses, etc., is a "Change in Estimate".

The resulting tax reserve deduction in 2016 = "After Change" December 2016 Tax Reserves – "Before Change" December 2015 Tax Reserves = 18 million – 15 million = 3 million.

7. **Learning Objectives:**
1.   The candidate will understand U.S. life insurance company financial statements and reports.

Learning Outcomes:
(1d)   Describe, apply and evaluate the appropriate accounting treatments for insurance products, separate accounts, assets, derivatives and reinsurance.

Sources:
US GAAP for Life Insurers, Second Edition, Ch. 13 (excl. 13.7)

LFV-100-07: Financial Reporting Developments Accounting for Derivative Instruments and Hedging Activities: A Comprehensive Analysis of FAS 133

Commentary on Question:
This question tested candidates' understanding of the treatment of assets and derivatives under US GAAP. Candidates were expected to describe and apply appropriate accounting treatment for an AFS bond.

Candidates generally did not do well on this question. Most candidates could explain how changes in bond's fair value affect GAAP financial statements, but did not demonstrate knowledge of the calculation of GAAP interest income and the GAAP financial statement impact from changes in fair value.

Solution:
(a)   Calculate the GAAP interest income earned in the second half of 2017. Show all work.

   Commentary on Question:
   Candidates struggled with the application of amortized cost. Some candidates divided the amortized cost by the par value to derive effective bond yield.

   Many candidates used an incorrect discount period for the coupon payments and par value. Another common mistake by candidates was assuming compound interest instead of simple interest.

   Some candidates estimated the effective yield without a financial calculator and were given most of the credit for demonstrating the correct concept.

7. Continued

Coupon Payment = $1,000 * 8% / 2 = $40, Maturity Value at year 5 is $1,040 = $1,000 + $40

Let Yield Rate at Purchase = i
Amortized Cost at year 2.5 = 1,045.77
$$= 40 * (1 + i)^{-0.5} + 40 * (1 + i)^{-1} + 40 * (1 + i)^{-1.5} + 40 * (1 + i)^{-2} + 1,040 * (1 + i)^{-2.5}$$

i = 6% solved using BA II Plus financial calculator

Interest Income = Prior Amortized Cost * Yield Rate at Purchase / 2
= 1,045.77 * 0.06 / 2 = 31.38

(b)   At the end of 2017, the fair value of the bond dropped to 900 due to rising interest rates, and your company has no intent to sell the bond prior to maturity.

(i)   Calculate the impact on the GAAP financial statements. Show all work.

(ii)   Explain how the impact will be reported on the GAAP financial statements.

Commentary on Question:
In part (i) some Candidates did not differentiate between amortized cost and fair value. Candidates omitted the variable "balance of bond valuation adjustment account" from the calculation. Another common mistake was equating OCI to the unrealized gain/loss on the bond instead of the change in unrealized gain/loss.

In part (ii) candidates were generally able to identify the key items needed for full credit.

(i)   Current Period Amortization of Premium = Coupon Cash Flow - Interest Income = 40 - 31.28 = 8.62

Amortized Cost = Prior Amortized Cost - Current Period Amortization of Premium = 1,045.77 - 8.62 = 1,037.15

Current Unrealized Gain/Loss = Fair Value - Amortized Cost = 900 - 1,037.15 = -137.15

OCI entry = Change in Unrealized Gain/Loss = Current Unrealized Gain/Loss - Prior Unrealized Gain/Loss = -137.15 - 21.95 = -159.10

7. **Continued**

     (ii)   The accounting treatment for the impairment of an AFS asset is dependent on whether the impairment is temporary or not. Other-than-temporary impairments flow directly through earnings, while temporary impairments are reflected in the "Other Comprehensive Income" (OCI).

             Since the company intends to hold the bond to maturity and the decrease in Fair Value is market dependent, the impairment should be considered temporary.

(c)   Assume the company purchased an interest rate swap to hedge the impact of fluctuating fair values of the bond.

    Explain how the impact will be reported on the GAAP financial statements.

Commentary on Question:
Most candidates recognized the interest rate swap as a Fair Value Hedge. A common mistake was identifying the hedge as a Cash Flow Hedge with the effective portion reflected in the OCI.

The hedge would be considered a Fair Value Hedge.

Gain/loss on the hedge asset and the offsetting gain/loss on the Fair Value of the bond attributable to changes in interest rates would be recognized in Earnings in the same accounting period.

The extent of which these two Gain/Loss items do not perfectly offset, the "ineffective portion", is also recognized in Earnings.

8. **Learning Objectives:**

2.   The candidate will understand valuation principles and methods of individual life insurance and annuity products issued by U.S. life insurance companies.

Learning Outcomes:

(2a)   Compare and apply methods for life and annuity product reserves.

(2b)   Evaluate, calculate, and interpret liabilities and DAC assets.

(2c)   Recommend and justify appropriate valuation assumptions.

Sources:

US GAAP For Life Insurers, Second Edition, Ch 8 Variable and Equity-Based Products

Commentary on Question:

This question tested candidates' knowledge of GAAP with respect to DAC, SOP 03-1 and FAS 133.

Solution:

(a)   Calculate GAAP pre-tax income in year 1. Show all work.

> **Commentary on Question**:
> *This part of the question tested candidates' knowledge of DAC calculations and the subsequent calculation of GAAP income. Candidates generally understood the concepts. Common problems were in the specifics of the DAC calculation or its integration into GAAP income.*
>
> *Some candidates attempted to calculate DAC using the FAS91 interest method. Given the apparent lack of surrender charge and death benefits, this approach was considered technically correct and given credit as appropriate. However, the text indicates that this approach is rarely used in practice, and the EGP approach would typically be used.*
>
> *Also, there were multiple approaches to the calculations (such as a prospective rather than retrospective version of the DAC balance calculation) that were valid and given credit when appropriate.*

> The deferred expenses and commissions are amortized over the Expected Gross Profit.
> Based on the information given in the question
> **The deferrable expense and commission are:**
> - Deferrable Commission: 5% of premium at beginning of **EACH** year.
>   5%*7000 = 350 @ Beginning of Year (BoY) 1, 2, 3
> - Deferrable Acquisition Expense: $125 at the beginning of the first year
> $125 @ BoY 1

---

8. **Continued**

- PV of Deferrable expenses = deferrable expense BoY1
  $+$ deferrable expense BoY2 / (1+interest)
  $+$ deferrable expense BoY3 / (1+interest)^2
  $= (350+125) + (350)/1.07 + (350)/1.07^2$
  $= 1107.81$

The EGP calculation:
- M&E Charge: 500 @ Middle of Year 1 (MoY1), 1000 @ MoY2, 1500 @ MoY3
- Load is a receivable the insurer would earn: 30 @ MoY1, MoY2, MoY3
- Maintenance Expense is a payable the insurer needs to pay: -25 @ MoY1, MoY2, MoY3

  EGP @ Year 1 = 500 +30-25 = 505
  EGP @ Year 2 = 500 +30-25 = 1005
  EGP @ Year 3 = 500 +30-25 = 1505
- PV (EGP) $= 505/(1.07)^{0.5} + 1005/(1.07)^{1.5} + 1505/(1.07)^{2.5} = 2667.01$

DAC Amortization Ratio:
- DAC Amortization Ratio = PV Deferrable Expense / PV EGP
  $= 1107.81/2667.01$
  $= 41.54\%$

DAC @ End of Year (EoY) 1

DAC @ EoY1 $=$ Total Deferrable Expenses @ Year1 * (1+interest)
  $-$ EGP * (1+interest) * DAC Amortization Ratio
  $=$ $(125+350)*(1.07) – (500+30-25)*(1.07^{0.5}) * 0.4154$
  $=$ 291.25

Pre-Tax GAAP Income
- Total Revenue $=$ M&E Charge + Loads per Policy + Interest
  $=$ $(500 +30) *1.07^{0.5}$
  $=$ 548.24

- Total Expenses $=$ Commission + Expenses + Amortization of DAC + Interest
  $=$ $350*1.07 + (125*1.07+50*1.07^{0.5}) + (0-291.25)$
  $=$ 242.86

- Pre-tax income $=$ Total Revenue – Total Expenses
  $=$ 548.24 – 242.86
  $=$ 305.38

8. Continued

(b) Describe the additional assumptions and types of calculations required to calculate GAAP pre-tax income if the policy contains Guaranteed Minimum Death Benefit (GMDB) and Guaranteed Minimum Accumulation Benefit (GMAB) riders.

Commentary on Question:
This part of the question tested candidates' knowledge of SOP 03-1 and FAS 133 related assumptions and calculations.
Many candidates had a difficult time recognizing the fact that the stochastic scenarios typically needed for both SOP 03-1 and FAS 133 would require additional assumptions.
On the calculation side, most candidate did well for the SOP part by listing out formulas for the benefit ratio and liability calculations. For FAS 133, the more challenging calculation for candidates to describe was the calibration of required profit at time of issue.

For GMDB

Assumptions:
GMDB requires additional SOP 03-1 related assumptions such as stochastic gross appreciation rates. Average gross appreciation rate is equal to the gross appreciation rate used for EGPs. An assumption for the volatility of returns would also be needed.

Calculations:
Scenario-specific account balance and excess death benefit to be used in SOP 03-1 liability determination. SOP03-1 liability requires a benefit ratio calculation, which is the PV of excess benefits divided by the PV of Assessments. Then the SOP03-1 balance is calculated by accruing at the discount rate, adding the Assessments multiplied by the benefit ratio and subtracting excess benefits paid: (Assessment x benefit ratio - excess benefits paid + interest). Also, EGPs in the DAC calculation are adjusted by change in GMDB SOP03-1 liability.

For GMAB

Assumptions:
GMAB requires additional FAS 133 related assumptions such as stochastic gross appreciation rates. Average of scenario-specific gross appreciation rate equals the risk-free forward interest rates, implying that the assumptions are market consistent. Assumption for volatility of returns is calibrated to implied volatility observed in the market.

8. Continued

Calculations:
FAS 133 would also use scenario-specific account balance and maturity benefit to be used in the liability determination. The maturity benefit is equal to excess of guaranteed amount (often the initial premium) over account balance. GMAB is a derivative, the value of which can be calculated as average present value of benefits less average present value of specified charges plus average present value of charges for required profit. At issue, a calculation is performed to calibrate the required profit such that the initial derivative value is zero.

(c) Describe the impacts to the DAC calculation, compared with the initial expectations, for each of the following situations:

(i) The equity markets decrease significantly at the end of the first year.

(ii) The actual premiums collected in the second year exceed the expected amount.

(iii) After one year, the future maintenance expense assumption is increased.

Commentary on Question:
This part of the question tested candidates' understanding of the relationship of inputs to the DAC calculation and resulting DAC impacts. Candidates that performed well described the components of the DAC calculation that changed because of the situation, and demonstrated how the change impacts the DAC calculation result.
Most candidates did well linking the situation to the correct DAC components, especially the effect on EGPs. However, many candidates were unable to follow through with the resulting impacts.

(i) Future EGP is lower because M&E fee is likely to decrease under a lower equity scenario. This will cause the amortization ratio to increase as the PV of EGPs is lower, while there is no change to deferred expenses. Therefore, the DAC balance will be lower as, in retrospect, more would have been amortized in year 1.

(ii) Increased premium will result increased deferred commission, which will directly increase the DAC balance. The future EGPs will also likely increase, making it uncertain whether the amortization factor will increase or decrease. Therefore, we cannot determine whether there would also be a retrospective true-up.

(iii) An increase to the future maintenance expense will decrease future EGPs. This will cause the amortization ratio to increase as the PV of EGPs is lower, while there is no change to deferred expenses. Therefore, the DAC balance will be lower as, in retrospect, more would have been amortized in year 1.

9. **Learning Objectives:**
3. The candidate will understand and apply emerging financial and valuation standards, principles and methodologies.

Learning Outcomes:
(3a) Describe, evaluate and calculate the impact on reserves, income, capital, and processes of emerging developments in Statutory and U.S. GAAP reporting, International Financial Reporting Standards, and Solvency Modernization.

(3b) Compare and contrast rules-based and principles-based approaches.

Sources:
LFV-808-16: Fundamentals of the Principle Based Approach to
Statutory Reserves and Risk Based Capital for Life Insurance and Annuities

Commentary on Question:
The question tested the candidates' knowledge of PBR.

Solution:
(a)
    (i) Calculate the deterministic reserve, as of December 31, 2017, using the present value of cash flows approach. Show all work.

    (ii) Describe an alternative method for establishing the deterministic reserve.

Commentary on Question:
Most candidates correctly identified at least some outflows and some inflows. Many candidates included FIT (reserve is pre-tax), ignored premium, COI, or expense charge, or otherwise tried to use GAAP concepts. Outflows include amounts owed to: policyholder, agent, or administration. Inflows include amounts collected from the policy or allocated portfolio income. Reserve is present value imbalance between outflows (increase in reserve) and inflows (decrease in reserve). Deterministic reserve is the balancing item for a moment in time, the moment after 12/31/2017.

Most candidates correctly used the 2018 cash flows and present valued the future cash flows one year. Some candidates present valued both or neither or otherwise tried to impute when a cash flow occurred even though timing was directly given.

9. Continued

The alternative method is the direct iteration approach. The important feature of this approach is liabilities will be liquidated by end of projection horizon. Iteration occurs because starting assets may have to be increased or decreased (with another iterative model run) to approach the amount needed to liquidate liabilities. The deterministic reserve is the starting asset amount needed to mature all the liabilities including the normal operation of the policies or contracts. Note that due to the nature of the starting assets (specific bonds, mortgages, etc.) and all the assumptions this amount could be more or less than present value of liabilities.

Many candidates mentioned the direct iteration approach and at least a portion of the description of projecting starting assets with premium and investment income iteratively to the point of fully liquidating the liabilities. A few candidates either described a proxy asset process or basing an entire projection on the first year of model results.

(i)
Using present value of cash flows approach over a single economic scenario:

(Outflows) Benefit and Expense = Death Benefit + Commission + Acquisition Expense + Maintenance Expense + Credit Interest (Ignore FIT)
For 2018 (Beginning of year) = 1 +4 +2 +1.5 +0.8 = 9.3
PV(2019+) = (45 +9 +8 +12 +30) / 1.04 = 104 / 1.04 = 100.0
PV(Benefit and Expense) 9.3 + 100.0 = 109.3

(Inflows) Income = Premium + COI + Expense Charge + Investment Income
For (2018) (Beginning of year) = 5 + 1.2 + 0.5 + 1.5 = 8.2
PV(2019+) = (60 + 10 + 4 + 22) / 1.04 = 96 / 1.04 = 92.3
PV(Income) = 8.2 + 92.3 = 100.5

Deterministic Reserve = PV(Benefit and Expense) – PV(Income)
Deterministic Reserve = 109.3 – 100.5 = 8.8

Netting is possible:
For 2018 (Beginning of year) = 1 +4 +2 +1.5 +0.8 –5 –1.2 –0.5 –1.5 = 1.1
PV(2019+) = (45 +9 +8 +12 +30 –60 –10 –4 –22) / 1.04 = 8 / 1.04 = 7.7
Deterministic Reserve = 1.1 + 7.7 = 8.8

9. **Continued**

(ii)
Alternatively, can use the Direct Iteration approach:
- Project starting assets along with premiums and investment income
- Liquidate all projected future benefits and expenses at end of projection horizon (fully mature the obligations of the policies being valued)
- Deterministic reserve = Statement Value of the Starting asset – Allocated Portion of pre-tax IMR

(b)

(i)   Calculate the December 31, 2017 reserve under PBR. Show all work.

(ii)   Assess whether or not the starting asset is appropriate for this model. Justify your answer.

Commentary on Question:
Most candidates found the CTE(70) from the ranked scenario results. A few candidates used other CTE levels and a few used the lowest values apparently because those scenario results had the highest scenario number labels.

Some candidates found the NPR with all its components. Most candidates recognized the applicable Cash Value floor. Some candidates ignored COI while some used half of COI amount.

For final reserve either method of NPR + Excess or using a maximum of NPR, Deterministic, or Stochastic was acceptable. However, the components had to be fully developed whether or not they affected the final reserve. Some candidates using the maximum approach found the correct final reserve without the correct Net Premium Reserve because of the numbers in the question.

Pre-PBR view was Assets = 100% Liabilities.   PBR view is there is a corridor of 98%-102% where Assets = 98%-102% of Liabilities. Many candidates expressed the pre-PBR view that starting assets must exactly equal liabilities. While 100% is within 98%-102%, it does not represent the PBR view.

From a practitioner point of view, it is not a trivial task to add or subtract bonds, mortgages, etc. Most companies manage to a tighter range than 98%-102%.

Because final reserve depends on a correct final answer from part (i) the corridor discussion was to be based on the final reserve stated from part (i). Consequently, a candidate could receive full credit on (ii) without correctly answering (i).

Some candidates set starting asset to CSV or NPR or some other value, ignoring the final reserve answer from part (i).

9. **Continued**

(i)
Stochastic Reserve = CTE(70) = Average of worst 30% scenarios
Stochastic Reserve = 10 * (230 + 215 + 200) / 30 or (230 + 215 + 200) / 3 = 215

Net Premium Reserve = Max (NPR before CSV, Cash Surrender Value, COI)
Net Premium Reserve = Max (100, 102, 23) = 102

Excess over NPR = Max (Deterministic Reserve, Stochastic Reserve) – NPR
Excess over NPR = Max (124, 215) – 102 = 113

Final Reserve = NPR + Excess over NPR = 102 + 113 = 215

Alternatively, component development was still necessary, while:
Final Reserve = Max (NPR, Deterministic, Stochastic)
Final Reserve = Max (102, 124, 215) = 215

(ii)
Actuary estimates projection PBR model starting assets amount as:
- Not less than 98% of the final aggregate model reserve, and
- Not greater than the <u>larger</u> of the net premium reserve or 102% of the final aggregate modeled reserve

Final reserve = 215. Acceptable starting asset: 210.7 (*98%*) to 219.3 (*102%*)
Actual starting asset = 198. 198 < 210.70
Starting asset amount is not appropriate (assets will need to be added).

(c)   TWA is developing a derivative investment program including a Clearly Defined Hedging Strategy (CDHS).

Describe the components of a qualified CDHS under PBR.

Commentary on Question:
Most candidates answered with at least a majority of the strategy components. Full credit was given for eight (8) of the listed points.

Strategy components:
- Risks being hedged
- Hedge objectives
- Risks not being hedged
- Financial instruments used
- Hedge trading rules
- Metrics for measuring hedging effectiveness
- Criteria that will be used to determine hedge effectiveness

9. Continued

- Frequency of measuring hedge effectiveness
- Conditions under which hedging will not take place
- Person(s) responsible for implementation
- Areas where basis, gap, or assumption risk have been identified
- Circumstances under which hedging strategy will not be effective

10. **Learning Objectives:**

4. The candidate will understand basic financial management, capital management and value creation principles and methods in a life insurance company context.

Learning Outcomes:

(4c) Explain and apply methods in determining risk based capital and economic capital.

(4d) Explain and evaluate the respective perspectives of regulators, investors, policyholders and insurance company management regarding the role and determination of capital.

(4e) Explain the U.S. Risk Based Capital (RBC) regulatory framework and principles.

Sources:
Valuation of Life Insurance Liabilities, Lombardi, 4th Edition, Ch. 16, sections 16.1-5

LFV-136-16: Life Insurance Products and Finance, Atkinson and Dallas, Chapter 11, pp. 499-502

A Multi-Stakeholder Approach to Capital Adequacy, Conning Research

Commentary on Question:
This question tested the candidates' knowledge of RBC and other capital measures and how they are used in the marketplace.

Solution:
(a)

(i) Explain the purpose of Risk-Based Capital (RBC).

(ii) Explain why principle-based RBC (such as C-3 Phase I and C-3 Phase II) is necessary.

Commentary on Question:
Candidates generally did well on this part of the question and demonstrated basic RBC knowledge.

(i)
- The main purpose of RBC is to reduce the risk of insolvency.
- It is a method of measuring the minimum amount of capital needed to support overall operations.
- It is the primary measure used by regulators to ensure an insurance company's financial soundness.
- Falling below specified RBC ratio levels can trigger regulatory action.

10. Continued

(ii)
- The formula based RBC is based on life products with a simple design and is not necessarily appropriate for more complex life and annuity products.
- A principle-based method can better reflect the volatility of some assumptions.
- C3 Phase I tests interest sensitive products over a range of scenarios.
- C3 Phase II tests interest and equity risk of variable annuities with guarantees over a range of scenarios.

(b)

(i)   You are given the following details about the model to be used for RBC C-3 Phase I:

- It is the same cash flow model that was used for year-end Asset Adequacy Analysis cash flow testing.
- It uses scenarios from Asset Adequacy Analysis.
- The model lapse assumption is the cash flow testing assumption plus a margin for conservatism.
- The products that will be modeled are: single premium whole life, annual premium whole life, and single premium deferred annuities. Universal life (UL) and flexible premium annuities will not be modeled.

Critique this model relative to RBC C-3 Phase I requirements.

(ii)   The model produced the following results for the alternative 12 scenarios, ranked in order from largest to smallest capital need:

Scenario	1	2	3	4	5	6	7	8	9	10	11	12
Capital needed (in millions)	25	15	12	10	7	5	5	0	0	0	0	0

Determine the C-3 Phase I requirement. Show all work.

(iii) You are given the following results from the C-3 Phase II model for TOB Life's variable annuity with guaranteed living benefits product.

10. Continued

	Millions
CTE(75) of required capital	30
CTE(90) of required capital	40
CTE(99) of required capital	55
Starting assets	25
Statutory reserve	60

Determine the C-3 Phase II requirement. Show all work.

Commentary on Question:
This part of the question tested candidates' knowledge of calculation techniques for C3 Phase I and C3 Phase II.

(i)
- It is appropriate to use the same model that was used for cash flow testing.
- The model should not use the same scenarios as cash flow testing. It should use a set of either 12 or 50 scenarios taken from 200 scenarios from the random scenario generator.
- The model should use the same assumptions that were used in the cash flow testing models.
- C3 Phase I should test all annuities and single premium life. The annual premium whole life product should not be tested. The flexible premium annuities should be tested. In addition, if the UL business contains any single premium UL policies, those should be tested as well.

(ii)
C3 Phase I requirement = average of 2nd and 3rd ranked scenarios, but not less than half of worst scenario
Average of 2nd and 3rd ranked scenarios = (15+12)/2 = 13.5
Half of worst scenario = 25/2 = 12.5
13.5 > 12.5, so C3 Phase I requirement is 13.5

(iii)
Additional Asset Requirement (AAR) = CTE(90) = 40
Total Asset Requirement (TAR) = AAR + starting assets = 40 + 25 = 65
C3 Phase II requirement = TAR - stat reserve = 65 - 60 = 5

10. Continued

(c)   TOB Life, a publicly-traded insurer, calculates three capital measures: RBC ratio, Standard and Poor's Capital Adequacy Ratio (S&P CAR), and Economic Capital. Your colleague makes the following statements:

A.   *"A reduction in our S&P CAR is okay so long as our RBC ratio doesn't decrease. Since the RBC ratio is the measure regulators look at, it is the item that has the most consequences."*

B.   *"As long as we have as much capital as possible to cover our existing business, all of our stakeholders will be satisfied."*

C.   *"The following chart compares our company to our closest competitor, BAX Life:*

	RBC ratio	S&P CAR	Economic Capital
TOB Life	350%	150%	100 million
BAX Life	350%	150%	60 million

Obviously TOB Life is better prepared to cover its risks."

Critique each statement.

Commentary on Question:
This part of the question tested candidates' knowledge of a select capital measures in wide use within the life insurance industry.

A

TOB Life should not ignore the S&P CAR; while not used by regulators, a drop in this ratio could have negative consequences elsewhere. A drop in the S&P ratio could cause a decrease in TOB's ratings; this could increase the cost of attracting new capital. TOB is a publicly traded company, and a drop in its rating could make various stakeholders, such as shareholders and policyholders, nervous about the financial health of the company.

10. Continued

B

This is not completely true for all stakeholders. Shareholders want to maximize their return on capital but still have enough capital to absorb unexpected risks. They would not want the company to hold excessive capital because they are concerned about inefficient use of capital. Stakeholders such as shareholders and ratings agencies want the company to have enough capital to support future growth, not only enough to cover existing business. Ratings agencies take a long-term view of a company and examine future profitability.

C

This is not necessarily true; you cannot conclude that TOB is in a better capital position just because it has a higher Economic Capital (EC) number. EC models are customized for each company and are not comparable. They are not transparent, so the EC number is pretty much useless to those outside of the company. The two companies may have included different risks in their EC models, may have used different time horizons, or may have used different risk thresholds. They may also have very different amounts of risks in the tail of the distribution, which the EC number doesn't capture.

(d)

    (i)   Calculate the distributable earnings. Show all work.

    (ii)   To calculate future distributable earnings, you project the whole life block over 30 years. Explain why the distributable earnings calculation may need to be adjusted.

    (iii)   Propose one technique for adjusting the distributable earnings calculation.

Commentary on Question:
This part of the question tested the candidates' knowledge of distributable earnings and adjustments that practitioners may have to make in the models.

(i)

Distributable Earnings = Pre-tax Solvency Earnings - Tax - Increase in Required Capital + After-tax Investment Income on Required Capital

Pre-tax Solvency Earnings = Premium - Benefits - Expenses + Investment Income - Increase in Solvency (Stat) Reserve

10. Continued

Pre-tax Solvency Earnings = 70 - 40 -10 + 25 - 15 = 30

Distributable Earnings = 30 - 10 - 12 + 4 = 12

(ii)

The business was projected over 30 years, however many whole life products remain in force longer than 30 years; therefore, not all future profits and losses would be included in the projected cash flow stream. A large amount of capital may be tied up in the required capital at the end of the projection.

(iii)

To compensate for not taking all future years profit into account in the projection, you can release the required capital at the end of the projection (i.e. Required Capital at year 30 = 0). This can be done by either 1) explicitly releasing the 30th year required capital into distributable earnings or 2) setting the lapse rate = 100% at the end of the projection (this will cause reserves to drop to 0 and cash values to be paid out as benefits in the profit calculation).